

CLAIMS

1. A curved optical waveguide comprising:

a core; and

a clad,

characterized in that:

a core shape of the curved optical waveguide has no reversal of a curvature on a halfway; and

curvatures at both ends of the curved optical waveguide gradually approach zero.

2. A curved optical waveguide comprising:

a core; and

a clad,

wherein:

a core shape of the curved optical waveguide has no reversal of a curvature on a halfway;

a curvature at one end of the curved optical waveguide gradually approaches zero; and

a radius of curvature at the other end of the curved optical waveguide is finite.

3. A curved optical waveguide according to claim 1, wherein the core shape is defined by the following equation [I]:

$$y = \sin \pi x \dots \dots \dots [I]$$

wherein **y** and **z** represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present.

4. A curved optical waveguide according to claim 1, wherein the core shape is defined by the following equation [II]:

$$\mathbf{y} = \mathbf{z} - [(1/\pi) \sin \pi \mathbf{z}] \dots \dots \text{[II]}$$

wherein **y** and **z** represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present.

5. A curved optical waveguide according to claim 1, wherein the core shape is defined by the following equation [III]:

$$\mathbf{y} = \mathbf{z} - [(a/\pi) \sin \pi \mathbf{z}] \dots \dots \text{[III]}$$

wherein **y** and **z** represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, and **a** represents a real number except zero.

6. An optical waveguide comprising:

the curved optical waveguide according to claim 1; and
an optical waveguide having a different core shape
optically connecting with each other.

7. An optical waveguide comprising:

the curved optical waveguide according to claim 1; and
an optical waveguide having a different core shape

optically connecting with each other in a manner that their geometrical central axes are aligned with each other.

8. An optical waveguide according to claim 6 or 7, wherein the optical waveguide having the different core shape comprises a non-S-shape curved optical waveguide comprising a core and a clad in which a core shape of the non-S-shape curved optical waveguide has no reversal of a curvature on a halfway, a curvature at one end of the non-S-shape curved optical waveguide gradually approaches zero, and a radius of curvature at the other end of the non-S-shape curved optical waveguide is finite.

9. An optical waveguide according to claim 8, wherein the core shape is defined by the following equation [IV]:

$$\mathbf{y} = 1 - \cos[(\pi/2)\mathbf{z}] \dots \dots \dots \text{[IV]}$$

wherein **y** and **z** represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present.

10. An optical waveguide according to claim 8, wherein the core shape is defined by the following equation [V]:

$$\mathbf{y} = (1 - \mathbf{t})f(\mathbf{z}) + \mathbf{t}\{1 - \cos[(\pi/2)\mathbf{z}]\} \dots \text{[V]}$$

wherein **y** and **z** represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, $f(\mathbf{z})$ represents a continuous function of **z** which satisfies relationships

of $f(0) = 0$, $f(1) = 1$, $f''(0) = 0$, and $f''(1) = 0$ where $f''(z)$ represents a second differential function of $f(z)$ with respect to z , and t represents a real number except zero.

11. An optical waveguide according to claim 8, wherein the core shape is defined by the following equation [VI]:

$$y = (1 - t)z + t\{1 - \cos[(\pi/2)z]\} \dots [VI]$$

wherein y and z represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, and t represents a real number except zero.

12. An optical waveguide according to claim 8, wherein the core shape is defined by the following equation [VII]:

$$y = (1 - t)[z - (a/\pi)\sin \pi z] + t[1 - \cos[(\pi/2)z]] \dots [VII]$$

wherein y and z represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, and t and a each represent a real number except zero.

13. An optical waveguide according to claim 6 or claim 7, wherein the optical waveguide having the different core shape is a branching section of the optical waveguide.

14. An optical waveguide according to claim 13, wherein an

inlet of said branching section of the optical waveguide is optically connected with one end of said curved optical waveguide.

15. An optical waveguide comprising:
the curved optical waveguide according to claim 1; and
an optical fiber optically connected with an end of said curved optical waveguide.

16. An optical waveguide comprising:
the curved optical waveguide according to claim 1; and
a guide groove structure for fixing an optical fiber to an end of said curved optical waveguide
disposing adjacent with each other.

17. An optical waveguide according to claim 13, wherein
an inlet of said branching section of the optical waveguide is optically connected with one end of the curved optical waveguide;
and further comprising another branching section of the optical waveguide optically connected with the other end of said curved optical waveguide.

18. A curved optical waveguide according to claim 2, wherein
the core shape is defined by the following equation [IV]:

$$y = 1 - \cos[(\pi/2)z] \dots \dots \dots \text{[IV]}$$

wherein \mathbf{y} and \mathbf{z} represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present.

19. A curved optical waveguide according to claim 2, wherein the core shape is defined by the following equation [V]:

$$\mathbf{y} = (1 - \mathbf{t})f(\mathbf{z}) + \mathbf{t}\{1 - \cos[(\pi/2)\mathbf{z}]\} \cdots [V]$$

wherein \mathbf{y} and \mathbf{z} represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, $f(\mathbf{z})$ represents a continuous function of \mathbf{z} which satisfies relationships of $f(0) = 0$, $f(1) = 1$, $f''(0) = 0$, and $f''(1) = 0$ where $f''(\mathbf{z})$ represents a second differential function of $f(\mathbf{z})$ with respect to \mathbf{z} , and \mathbf{t} represents a real number except zero.

20. A curved optical waveguide according to claim 2, wherein the core shape is defined by the following equation [VI]:

$$\mathbf{y} = (1 - \mathbf{t})\mathbf{z} + \mathbf{t}\{1 - \cos[(\pi/2)\mathbf{z}]\} \cdots [VI]$$

wherein \mathbf{y} and \mathbf{z} represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, and \mathbf{t} represents a real number except zero.

21. A curved optical waveguide according to claim 2, wherein the core shape is defined by the following equation [VII]:

$$\mathbf{y} = (1 - \mathbf{t})[\mathbf{z} - (a/\pi)\sin \pi \mathbf{z}] + \mathbf{t}\{1 - \cos[(\pi/2)\mathbf{z}]\} \cdots \cdots [VII]$$

wherein **y** and **z** represent coordinate axes perpendicular to each other on a plane where the optical waveguide is present, and **t** and **a** each represent a real number except zero.

22. An optical waveguide comprising:

the curved optical waveguide according to claim 2; and an optical waveguide having a different core shape optically connecting with each other.

23. An optical waveguide according to claim 22, wherein the optical waveguide having the different core shape is a branching section of the optical waveguide.

24. An optical waveguide according to claim 23, wherein the branching section of the optical waveguide is disposed by optically connecting an outlet of the branching section of the optical waveguide with an end of the curved optical waveguide having a finite radius of curvature.

25. An optical waveguide according to claim 23, wherein the branching section of the optical waveguide is disposed by optically connecting an inlet of the branching section of the optical waveguide with an end of the curved optical waveguide whose curvature gradually approaches zero.

26. An optical waveguide comprising:
the curved optical waveguide according to claim 2; and
an optical fiber disposed by being optically connected with
an end of the curved optical waveguide whose curvature gradually
approaches zero.

27. An optical waveguide comprising:
the curved optical waveguide according to claim 2; and
a guide groove structure for fixing an optical fiber to an
end of the curved optical waveguide whose curvature gradually
approaches zero, the guide groove structure being disposed to be
adjacent to the curved optical waveguide.

28. An optical waveguide comprising:
the curved optical waveguide according to claim 2; and
a reflecting surface including a filter disposed to be adjacent
to an end of the curved optical waveguide having a finite radius
of curvature.

29. An optical waveguide according to any one of claims 1 to
28, wherein at least one of the core or the clad of the optical
waveguide is partially or entirely composed of a polymer.

30. An optical waveguide according to claim 29, wherein the polymer comprises a polyimide-based resin containing fluorine.

31. An optical device comprising the optical waveguide according to any one of claims 1 to 30.